Available online at www.sciencedirect.com

ScienceDirect

Procedia Economics and Finance 39 (2016) 39 – 43

Procedia Economics and Finance

www.elsevier.com/locate/procedia

3rd GLOBAL CONFERENCE on BUSINESS, ECONOMICS, MANAGEMENT and TOURISM, 26-28 November 2015, Rome, Italy

Analysis of the milk production and milk price in Latvia

Liga Paura[a]*, Irina Arhipova[a]

[a]*Latvia University of Agriculture, Liela street 2, Jelgava, LV 3001, Latvia*

Abstract

Dairy farming (milk production) is one of the important sectors in agriculture economic in Latvia. After joining the EU the dairy sector in Latvia has changed, small dairy farms could not complete the new technological requirements of milk production and it was the time when in the country the amount of dairy cows was reduced by 9.3% during the two years from 2003 to 2004. During the last ten years farms involved in commercial milk production often had substantial modernization, the farmers are motivated to improve cows keeping and feeding. The smaller number of dairy cows is partly offset by the regular growth of their milk yield. Thereby average milk yield per cow during the ten years has increased by 42% and has reached 6993 kg in 2014. Milk price is depending on the economic and political situation in the world, it is also influenced by the geographic location, seasonality, and raw materials (feed, electricity, fuel) prices. During the last 10 years the average milk price in Latvia has increased by 60% with variation during the seasons therefore the purpose of this paper is to analysis the milk supply and demand to its price, using the forecasting models.

Peer-review under responsibility of the Organizing Committee of BEMTUR- 2015

Keywords: milk suplly, decomposing model, forecasting model;

1. Introduction

Dairy farming (milk production) is of great importance to the European Union (EU) and is one of the important sectors in agriculture economic in Latvia. Total EU-28 milk production is estimated around 154 million tons in 2014 year. According the European Commission data (2015) the EU's main producers are Germany, France, the United Kingdom, the Netherlands, Italy and Poland which together account for more than 70% of the EU milk production. Latvia accounted for 0.6% of total EU-28 milk production or around 0.9 million tons in 2014. Milk production in

* Liga Paura. Tel.: +371-630-05705; fax: +371-630-05705;
E-mail address: liga.paura@llu.lv

Peer-review under responsibility of the Organizing Committee of BEMTUR- 2015
doi:10.1016/S2212-5671(16)30238-6

Latvia has continued to increase after joining the EU and in 2014 cover 133 % of the self-sufficiency of milk and about 60% of produced milk Latvia is exported.

After joining the EU the dairy sector in Latvia has changed, small dairy farms could have not completed the new technological requirements of milk production and it was the time when in the country the amount of dairy cows was reduced by 9.3% during the two years from 2003 to 2004. Therefore in 2009 the numbers of dairy cows have decreased till 120.8 thousand, but during the last five years have increased and in 2014 reached 130.7 thousand cows.

During the last ten years farms involved in commercial milk production often had substantial modernization of existing farm and construction of new dairy farms. The farmers are motivated to improve cows keeping and feeding. Technological solutions are being implemented: loose handling of cows, automatic milking systems, total mixed ration or usage of precise feeding technology (Salins et al., 2012). In 2011 about 200 farms were subsidized for this purpose. The smaller number of dairy cows in Latvia is partly offset by the regular growth of their milk yield. Thereby average milk yield per cow during the ten years has increased by 42% and has reached 6993 kg in 2014.

Within the framework of milk supply quota 804.4 thousand tons of milk was supplied in 2014, which is 9.3% more than in 2013. The average purchased milk price decreased from EUR 305 per ton in 2013 to EUR 291 per ton in 2014 or was reduced by 4.6% (Lazda-Lazdina, 2015). Therefore, the goal of this article is to analyze the trends in milk supply using the forecasting models and to analysis the milk supply relation to its price in different years in Latvia.

2. Analysis of milk production

The analysis has been conducted using the milk supply and milk price data of Central Statistical Bureau of Latvia (2015). The total monthly milk supply in Latvia from 2002 – 2014 is reviewed. Between 2002 and 2014 milk production is increased by 47.9% or from 384871.4 to 804274.1 ton. Latvia farmers produce more milk in the summer than in the winter. The higher produced milk amount are in July or August, when in November the milk amount fall in average more than 30% of summer month production. For example, in 2014 summer milk production (June, July and August) was 29% and winter milk production (December, January and February) was only 14% of total annual milk production.

For climatic reasons most of the EU country have seasonal milk production. As a result by Shalloo at al. (2008) over the past 30 years milk supplies in Irish were depending on the season. Peak month (May) accounts for 14% to 15% of the total, while the through month (January/December) accounts for 2 to 3%. In the study by Wyss et al. (2011) was found in Switzerland are the seasonality of milk production in pasture based farms compare to indoors farms with higher milk production in April and May and lower in December and January. In the indoors farms over the whole year milk production was more balanced.

According to the linear model analysis (Tab.1) the milk supply were influenced significantly at the 1% level by factors of time trend and month as seasonal effect. Milk supply in Latvia was analyzed by seasonal time series decomposing model. Seasonal milk production with peak every summer and trough every winter, the seasonal and random fluctuations constant in size over time can be described using an additive decomposing model. The time trend, seasonal and irregular decomposing model components of milk supply production were described using an additive model.

Table 1. Analysis of month and time trend factors influence to milk supply.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	25016102740.5	12	2084675228.3	214.6	.000
Intercept	42593442411.1	1	42593442411.1	4385.0	.000
Month	10282728947.8	11	934793540.7	96.2	.000
Time trend	14090408700.2	1	14090408700.2	1450.6	.000
Error	1389020267.4	143	9713428.4		
Total	414795607047.1	156			
Corrected Total	26405123008.0	155	R Squared = 0.947		

The estimated year trend component shows milk production increase from 32322 ton in 2002 to about 50500 ton in 2007 – 2008 periods, followed by a small decrease in 2009 and a steady increasing to 67171 ton in 2014 (Fig. 1). The trend component dominates in the data series and the effect of residuals components is relatively small, in range from -4111 to 2981 ton.

The largest seasonal factor was for August (11987 ton), and the lowest was for February (-11545 ton), indicating that the peak of milk production was in August and the trough in February each year. The prediction values of milk in Latvia for January and February 2015 were obtained using the results of estimated time series model (1), where M_i is a milk production (ton), T_i is trend by month, as well *January – November* are the month seasonal factor.

$$M_i = 26986.9 + 211.6 \cdot T_i - 1060.1 \cdot January - 5206.7 \cdot February - 746.9 \cdot March + 658.7 \cdot April + 9804.7 \cdot May + 15836.1 \cdot June + 17400.9 \cdot July + 18234.6 \cdot August + 14149.8 \cdot September + 7366.5 \cdot October - 911.2 \cdot November + \varepsilon_i \quad (1)$$

The results show that the trend coefficients, differential intercept associated with the December, coefficient for February, as well as May till October coefficients are statistically significant at the 1% level. This one may conclude that there is month seasonal factor operating of each year.

The trend coefficient of 211.6 tell us, that for each month, after taking into account seasonal effect, the average milk supply is expected to increase by about 211.6 ton. The average level of milk supply in December 2001 was 26986.9 ton and in the January 2002 it was less by 1060.1 ton. Respectively in February 2002 the average level of milk supply was less by 5206.7 ton, in March it was less by 746.9 ton, in April it was higher by about 658.7 ton, in May it was higher by 9804.7 ton, in June it was higher by about 15836.1 ton, in July it was higher by about 17400.9 ton, in August it was higher by 18234,6 ton, in September it was higher by 14149.8 ton, in October it was higher by 7366.5 ton and in November it was less by 911.2 ton.

Figure 1 shows produced and predicted tonne of supply milk, which demonstrate that there are no significant variations among the actual and prediction value during the 2002 – 2014. The absolute percentage error was under 8%, which is considered as a good approximation.

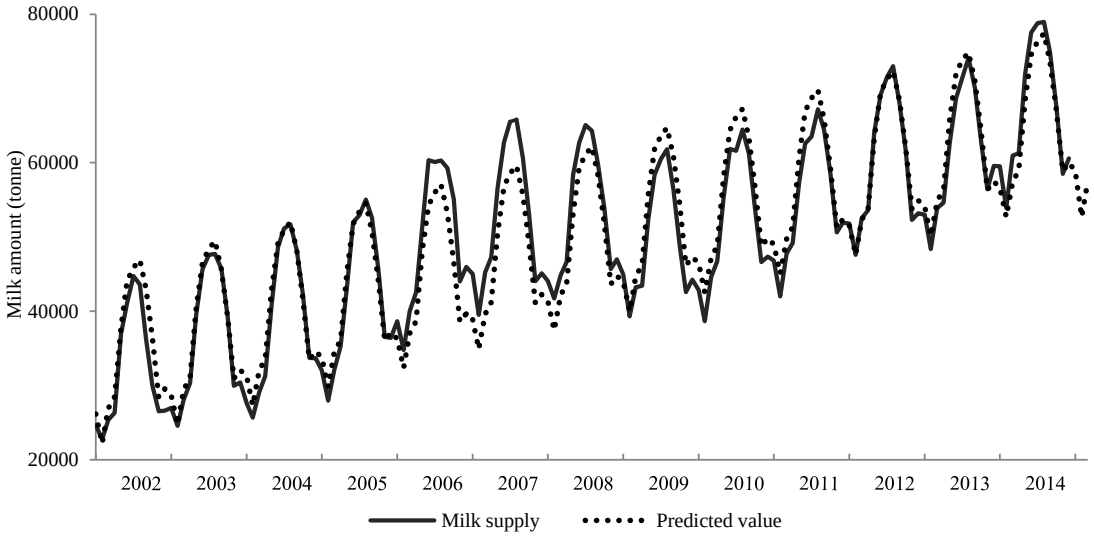

Fig. 1. Milk supply and predicted milk amount in 2002-2014.

Table 2. Analysis of influence of milk supply and year to milk price.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	467004.7	13	35923.4	54.5	.000
Intercept	320649.6	1	320649.6	486.7	.000
Milk supply	4687.6	1	4687.6	7.1	.009
Year * Milk supply	295415.0	12	24617.9	37.3	.000
Error	93535.7	142	658.7		
Total	9189068.9	156			
Corrected Total	560540.531	155	R Squared = 0.833		

3. Milk supply and milk price

The second question which has been researched was – to analyze milk price and relationship between milk supply and milk price. In 2002 the average milk price in Latvia was 135.7 EUR per ton. Between 2002 and 2008 milk price was increased and the highest milk price 338.9 EUR per ton was in February 2008.

The financial crisis in the global economy caused international demand for dairy produce to decline in late 2008 and had a dramatic impact on product prices during the first half of 2009 (Blasko, 2011).

In summer 2009 the average milk price in Latvia was around 155 EUR per ton and during the winter of 2009 was stabilized. The milk price increase from year to year with seasonal fluctuations with milk price peak 351.5 EUR per ton in March 2014. In the end of the 2014 the milk price was the same level than in the first half 2007.

Analysis of covariance (Tab.2.) show that milk price significantly depends on milk supply ($p<0.01$) and interaction effect of year and milk supply ($p<0.001$). The significant interaction effect of year and milk supply means that the differential slope coefficients are statistically significant, strongly indicating that the regressions for the different years are different.

Analysis of covariance results show that when milk supply increase the milk price decrease. For example in 2002 and 2003 time period when the milk supply was at the same level 25 – 45 thousand tones the milk price was in range from 125 to 150 EUR per ton, but in 2012 when the milk supply was at the level of 47 – 73 thousand tones the milk price was in range from 248 to 302 EUR per ton (Fig.2.).

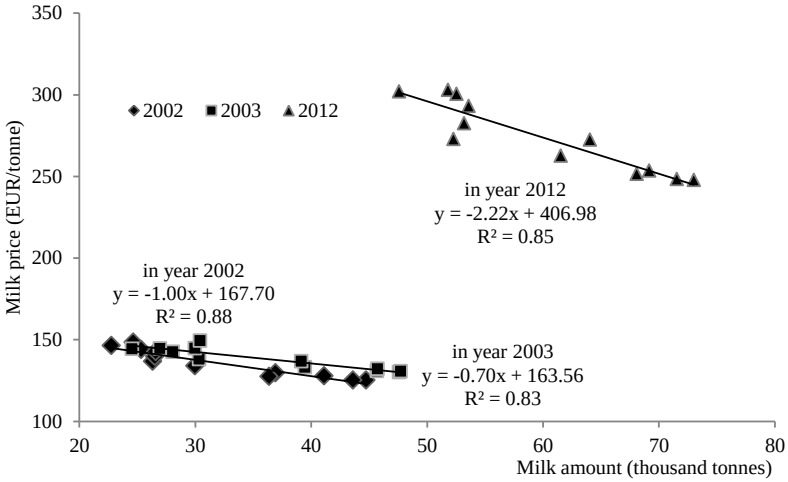

Fig. 2. Relationship between milk supply and milk price.

The slope coefficient of milk supply -1.00 in 2002 tell us, that for each one thousand tons of milk supply the average milk price is expected to decrease by about 1 EUR per ton. Accordingly, the slope coefficient of milk supply -0.70 in 2003 tell us, that for each one thousand tons of milk supply the average milk price is expected to decrease by about 70 cents per ton.

In 2012 the slope coefficient of milk supply -2.22 tell us, that for each one thousand tons of milk supply the average milk price is expected to decrease by about 2.2 EUR per ton.

4. Conclusions

In this study the amount of milk supply from 2002 to 2014 were evaluated and predicted by seasonal time series decomposing model. According to the research results milk supply significantly depends on time trend and month seasonal factor ($p<0.001$). For climatic reasons Latvia has seasonal milk production and during the last decade the milk production was increased. Milk price depends on milk supply ($p<0.01$) and interaction effects of year and milk supply ($p<0.001$). There is relationship between milk supply and milk price, when milk productions increase the milk price decrease. Therefore other factors besides the milk supply affect milk price. The estimation of other factors is a topic for future research.

References

Blasko, B. (2011). Analysis of the producer price of Hungarian raw milk in international comparison. Apstract: Applied Studies in Agribusiness and Commerce 6 (5), 27-32. Retrieved from http://purl.umn.edu/147410

Central Statistical Bureau of Latvia, 2015. Retrieved from http://www.csb.gov.lv.

European Commission, 2015. Retrieved from http://ec.europa.eu/agriculture/milk/index_en.htm.

Lazda-Lazdina, L. (2015). Livestock production in Latvia witnessed growth in 2014. International Internet magazine. Baltic States news & analytics, 25.03.2015. Retrieved from http://www.baltic-course.com/eng/good_for_business/?doc=104033

Mach, J., Rezbova, H. (2009). Comparison of milk production costs among EU members. Agris on-line Papers in Economics and Informatics 1 (1), 13-20. Retrieved from http://ageconsearch.umn.edu/bitstream/96847/2/agris_on-line_2009_1_mach_rezbova.pdf

Shalloo, L., Dillon, P., Wallace M. (2008). Development of an efficient milk production profile of the Irish dairy Industry. Project: Final Report. Retrieved from http://www.agresearch.teagasc.ie/moorepark/EndofProjectReports/eopr-2008-5394.pdf

Salins, A., Freimanis, M., Truhanovs, R., Priekulis J. (2012). The most efficient solutions of forage distribution on modern dairy cow farms. Agronomy Research Biosystem Engineering Special Issue 1, 219-226. Retrieved from http://agronomy.emu.ee/vol10Spec1/p10s125.pdf

Wyss, U., Mauer, J., Frey, H., Reinhard, T., Bernet, A., Hofstetter, P. (2011). System comparison milk production Hohenrain: milk quality and seasonal milk production. Agrarforschung Schweiz 2(9), 412-417. Retrieved from http://www.agrarforschungschweiz.ch/archiv_11en.php?id_artikel=1697